

REMARKS

The Office Action dated June 13, 2007 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Following the present amendment, claims 12-31 are currently pending in the application, of which claims 12 and 13 are independent. More specifically, Applicants herein amend claims 12-15, 30, and 31. It is respectfully submitted that the amendment adds no new subject matter to the present application and serves only to place the present application in better condition for examination. In particular, the present amendment clarifies the subject matter of the claims and brings the claims into better conformance with preferred patent practice in the United States. Entry of the amendment and reconsideration of the rejected pending claims are respectfully requested. It is believed that all grounds for rejection in the Office Action have been addressed and that the present application is currently in condition for allowance in view of the amendment and the following arguments. Claims 12-31 are respectfully submitted for reconsideration.

Claim Rejection Under 35 U.S.C. §103(a)

In Section 2, the Office Action rejects claims 12 and 13 under 35 U.S.C. §103(a) as being allegedly unpatentable over U.S. Patent No. 6,064,167 of Takenaka et al. (the Takenaka reference) in view of U.S. Patent No. 6,381,515 of Inoue et al. (the Inoue reference). According to the Office Action, Takenaka discloses all recitations of claims

12 and 13 except for mobile robot having both internal and external memory, but that this deficiency is cured by Inoue. However, as will be discussed below, each of claims 12 and 13 currently recites subject matter which is neither disclosed nor suggested in either Takenaka or Inoue. Applicants respectfully traverse this rejection and request reconsideration in view of the current amendment and the following arguments.

Claim 12, from which claim 14, 16, 18, 20, 22, 24, 26, 28, and 30 depend, now discloses a system for detecting abnormality of a mobile robot having at least a drive motor. The system includes an internal sensor that senses a quantity of state of the robot and a control unit constituted by an onboard microcomputer that operates the drive motor based on the quantity of state obtained from an output of the internal sensor to move. The control unit includes a multiple distributed control units that are distributed to be disposed at each of onboard equipments mounted on the robot, including at least the internal sensor and the drive motor, for self-diagnosing whether at least one of onboard equipments is abnormal. The system further includes self-diagnosis means for self-diagnosing whether the quantity of state is an abnormal value. The system further includes distributed control unit self-diagnosis result inputting means for inputting a self-diagnosis result by each of the distributed control units. The system further includes abnormality information outputting means for, when at least an abnormality of one of the quantity of state and the mounted equipments on the robot is self-diagnosed based on the self-diagnosis result by the self-diagnosis means and the inputted self-diagnosis result by the distributed control units, storing information of the abnormality in a shared memory

provided in the control unit and outputting the information of the abnormality affixed with a time on which the abnormality occurred. The system may also include abnormality information storing means for storing the output of the abnormality information outputting means in an internal memory provided in the control unit and in an external memory provided outside the robot.

Claim 13, from which claim 15, 17, 19, 21, 23, 25, 27, 29, and 31 depend, discloses a system for detecting abnormality of a mobile robot having at least a drive motor. The system includes an internal sensor that senses a quantity of state of the robot and a control unit constituted by an onboard microcomputer that operates the drive motor based on the quantity of state obtained from an output of the internal sensor to move. This control unit includes distributed control units that are distributed to be disposed at each onboard equipments mounted on the robot, including at least the internal sensor and the drive motor, for self-diagnosing whether at least one of onboard equipments is abnormal. The disclosed system further includes self-diagnosis means for self-diagnosing whether the quantity of state is an abnormal value, or whether at least one of onboard equipments mounted on the robot including at least the drive motor and the internal sensor is abnormal. The system further includes distributed control unit self-diagnosis result inputting means for inputting a self-diagnosis result by each of a plurality of the distributed control units. The system may further include abnormality information outputting means for, when at least an abnormality of one of the quantity of state and the mounted equipments on the robot is self-diagnosed based on the self-diagnosis result by

the self-diagnosis means and the inputted self-diagnosis result by the distributed control units, storing information of the abnormality in a shared memory provided in the control unit and outputting the information of the abnormality affixed with a time on which the abnormality occurred. Lastly, the system may further include abnormality information storing means for storing the output of the abnormality information outputting means together with a parameter indicative of the quantity of state of the robot, in an internal memory provided in the control unit and in an external memory provided outside the robot.

The Office Action alleges that Takenaka teaches a robotic device having a “self-diagnosis means,” an “abnormality information outputting means,” and an “abnormality information storage means” with an “internal memory” or an “external memory” The Office Action argues that while Takenaka describes a robotic device having either an “internal memory” or an “external memory,” Inoue teaches a robot having both an “internal memory” and an “external memory” as specified in claims 12 and 13.

However, as described below, Takenaka does not disclose or suggest each and every limitation of independent claims 12 and 13. Instead, Takenaka teaches a robotic system that performs a different function in a different way to achieve a different purpose from the abnormality information outputting means specified in claims 12 and 13.

Takenaka discloses a robot R having as a plurality of movable legs 3 extending downwardly from an upper body 2 and having actuators (16a, 16b, and 16c) in the leg joints (5a, 5b, 5c). A malfunction processor 13 with a fall judging unit 27 monitors

several operational values and determines when one or more of the operational values falls outside of associated predefined ranges, indicating that the robot is likely to fall while operating. When a fall is predicted by the malfunction processor 13, a linked robot leg control unit 12 that controls the joints of the legs causes the actuators to lower the robot's center of gravity. In the malfunction processor 13, the fall judging means connects with an operation status outputting means 28 to store information on the status of the robot.

As described in Takenaka at column 9, lines 23-34, the operational status data is acquired periodically "from time-to-time." According to Takenaka, at column 9, lines 35-39, "When an expected fall signal is supplied from the fall judging means 27, "the operation status outputting means 28 outputs operation status data immediately prior to the expected fall signal or operation status data over a given period of time across the expected fall signal to the memory means 29." Thus, when a fall is predicted, the operational status data for the time period prior to the predicted fall is stored.

In contrast to Takenaka, claims 12 recites the limitation that the claimed systems include an "abnormality information outputting means for outputting, when an abnormality is self-diagnosed by the self-diagnosis means, information of the abnormality." This limitation does not appear to be taught or suggested in Takenaka. As explained above, the malfunction processor 13 in Takenaka outputs status data collected prior to a predicted fall, and this status information is not "information of the

abnormality.” As used in the present application, “information of the abnormality” generally relates to information on the occurrences of and causes for a failure.

Furthermore, claim 12 recites the limitation that the information of the abnormality is **“affixed with a time on which the abnormality occurred.”** As described above, Takenaka collects status data prior to the fall. However, this reference appears to contain no teaching or suggestion that the time of a predicted fall is affixed to the stored operational status data or that the operational status data is otherwise modified to reflect the time of the predicted fall.

In addition, claims 12 and 13 recite the further limitation that the claimed system must contain an “abnormality information storing means for storing the output of the abnormality information outputting means in an internal memory provided in the control unit and in an external memory provided outside the robot.” In rejecting these claims, the Office Action argues that Takenaka teaches that the operational status data gathered prior to a fall is stored in a memory means 29, which may be either (1) electronically erasable programmable read-only memory (EPROMS) according to column 9 at lines 41-45 or (2) an external memory means within a user controller connected by radio signals to the robot, according to column 19 at lines 4-18.

For at least these reasons, Takenaka does not teach or disclose each and every of the limitations recited in claim 12. Thus claim 12 is allowable over Takenaka for additional reasons. Similarly, claim 13 contains similar limitations as claim 12 and is allowable over Takenaka for the same reasons.

In addition, claim 13 recites that the output of the abnormality information outputting means is stored “together with a parameter indicative of the quantity of state of the robot” in the abnormality information storage means. It would appear to be improper to define recitation of “the parameter indicative of the quantity of state of the robot” (the information on the status of the robot as disclosed in Takenaka) to include the recitation of “information of the abnormality” because this interpretation would otherwise render meaningless this additional claim limitation of claim 13.

For at least these reasons, Takenaka does not teach or disclose each and every of the limitations recited in claim 13 and claim 13 is thus allowable over Takenaka.

Inoue does not cure the deficiencies in Takenaka. As described below, Inoue is directed to a robot having fixed and removable memory, and does not address abnormal events such as falls. Thus, Inoue contains no comparable elements to the abnormality information outputting means, and therefore, does not make up for these deficiencies in Takenaka.

Furthermore, while the Office Action concedes that Takenaka does not disclose a robot using both internal and external storage means and cites Inoue to cure this deficiency, Inoue also neither teaches nor suggests this recitation as described below.

Inoue discloses at column 2, lines 53-59, that a robot may have “an internal storage memory 23 as fixed storage means implemented by non-volatile flash memories mounted and fixed at a predetermined position ... and an external storage memory 24 as removable storage means disposed at a rear portion and implemented by a removal

memory card.” When referring to “external storage memory,” Inoue appears to describe a removable storage device generally affixed to the robot. In this way, Inoue seems to teach away from the limitation in claims 12 and 13 of “an external memory provided outside the robot.” For similar reasons, Inoue should not be combined with Takenaka since Inoue teaches away from the above-described embodiment of Takenaka in which of radio communication is used to forward operational data to memory storage in a separate external control unit.

For at least these reasons, we believe that both Takenaka and Inoue teach robotic systems that perform different functions in different ways to achieve different purposes from the abnormality information storage means recited in claims 12 and 13. In view of the above arguments, independent claims 12 and 13 should be allowable because Takenaka and Inoue do not teach or suggest each and every limitation of claims 12 and 13. Consequently, this portion of the Office Action is not supported, and the rejection of claims 12 and 13 should be withdrawn. Reconsideration and allowance of claims 12 and 13 is respectfully requested in view of these arguments and amendments. Furthermore, notwithstanding the following comments, claims 14-31 depend from either claims 12 or 13 , and because they include every limitation recited therein, are likewise allowable over the combination of Takenaka and Inoue. Reconsideration and allowance of pending claims 12-31 is respectfully requested.

In additional, while the Office Action Summary states that claims 22 and 23 are currently rejected, the Office Action does not specifically address or analyze these two

claims. Therefore, claims 22 and 23 should presumably be allowable as being uncontested in the Office Action since none of the other cited reference teaches or suggests a “floor force detector” and the related claim limitations. Therefore, although the claims 22 and 23 depend from rejected claims, these claims should be allowable if rewritten in independent format. In view the of arguments above regarding the rejection of claims 12 and 13, claims 22 and 23 should be allowed as depending from allowable claims 12 and 13. Furthermore, if claims 22 and 23 are later rejected in view of new art, this new Office Action must be non-final.

In section 3, the Office Action rejects claims 20 and 21 under 35 U.S.C. §103(a) as being unpatentable over the combination of Takenaka and Inoue as applied to claims 12 and 13, further in view of U.S. Patent No. 6,330,494 of Yamamoto (“Yamamoto”). According to the Office Action, Takenaka and Inoue disclose all recitations of claims 20 and 21 except for mobile robot having an external sensor, but that this deficiency is cured by Yamamoto. However, as will be discussed below, each of claims 20 and 21 recites subject matter which is neither disclosed nor suggested in Takenaka, Inoue, or Yamamoto. Applicants respectfully traverse this rejection and request reconsideration in view of the current amendment and the following arguments.

The Office Action states that Yamamoto teaches an “external sensor” as specified in claims 20 and 21. Specifically, the Office Action argues that Yamamoto provides a robot having a CCD camera 43 that captures images of the surround area, as depicted in

FIGS. 17A-17D, to determine the robot's orientation relative to the surrounding horizontal surface.

However, Yamamoto contains no comparable elements to the claimed "abnormality information outputting means" and "abnormality information storing means" and, therefore, does not make up for the above-described deficiencies in Takenaka and Inoue. For example, the robot in Yamamoto does not perform the functions of producing information of an abnormality, append a time stamp to the information of the abnormality, or store the information of the abnormality in both internal and external memories.

Accordingly, this portion of the Office Action is not supported and should be withdrawn since claims 20 and 21 should be allowable as depending from allowable claims 12 and 13. Reconsideration and allowance of claims 20 and 21 is respectfully requested in view of these arguments and amendments.

At section 4, the Office Action rejects claims 24-27 under 35 U.S.C. §103(a) as being unpatentable over the combination of Takenaka and Inoue as applied to claims 12 and 13, further in view of U.S. Patent No. 6,438,454 of Kuroki ("Kuroki"). According to the Office Action, Takenaka and Inoue disclose all recitations of claims 24 -27 except for mobile robot having an internal voltage and temperature sensors, but that these deficiencies are cured by Kuroki. However, as will be discussed below, each of claims 24-27 recites subject matter which is neither disclosed nor suggested in Takenaka, Inoue,

or Kuroki. Applicants respectfully traverse this rejection and request reconsideration in view of the current amendment and the following arguments.

Regarding claims 24 and 25, the Office Action states that Kuroki teaches a robot having an internal voltage sensor 354 and an internal temperature sensor 357 that perform the claimed functions of detecting a current provided to the drive motor and the temperature of the drive motor, and that readings from these sensors are used in a self-diagnosis system, as provided at column 11, lines 39-62.

In analyzing claims 26 and 27 in view of these cited references, the Office Action cites Takenaka to argue that robots having batteries and voltage sensors were well known prior to the filing of the present application. While the Office Action concedes that neither Takenaka nor Inoue teaches the limitation that “the self-diagnosis means self-diagnoses that the battery is abnormal when the output of the voltage sensor is smaller than a predetermined value,” the Office Action argues that this limitation is taught by Kuroki.

Nevertheless, Kuroki contains no comparable elements to the claimed abnormality information outputting means and abnormality information storing means and, therefore, does not make up for the deficiencies in Takenaka and Inoue. For example, the robot in Kuroki does not perform the functions of producing information of the abnormality, append a time stamp to the information of the abnormality, or store the information of the abnormality in both internal and external memories.

Consequently, claims 12 and 13 are allowable in view of the combination of Takenaka, Inoue, and Kuroki, and claims 24-27 should be allowed as depending from allowable claims 12 and 13. Accordingly, this portion of the Office Action is not supported, and the rejection of claims 24-27 should be withdrawn. Reconsideration and allowance of claims 24-27 is respectfully requested in view of these arguments and amendments.

At section 5, the Office Action rejects claims 28 and 29 under 35 U.S.C. §103(a) as being unpatentable over the combination of Takenaka and Inoue as applied to claims 12 and 13, further in view of U.S. Patent No. 6,684,130 of Ogure et al. (“Ogure”). According to the Office Action, Takenaka and Inoue disclose all recitations of claims 28-29 except for mobile robot having a voice recognition system, but that this deficiency is cured by Ogure. However, as will be discussed below, each of claims 28-29 recites subject matter which is neither disclosed nor suggested in Takenaka, Inoue, or Ogure. Applicants respectfully traverse this rejection and request reconsideration in view of the current amendment and the following arguments.

In particular, claims 28 and 29 add a limitation that the system includes a “voice recognition system,” and in response, the Office Action cites an embodiment of Ogure at column 10, lines 21-34. In this embodiment, the disclosed robot includes a controller 10 that is configured to accept voice data from a user using a microphone 16, and the

acquired voice data is compared to stored voice data in a control storage 10A to analyze the acquired voice data.

As with the previous cited references, nothing in Ogure appears to make up for the above-described deficiencies in Takenaka and Inoue. For example, the robot in Ogure does not perform the functions of producing information of the abnormality, append a time stamp to the information of the abnormality, or store the information of the abnormality in both internal and external memories.

Consequently, claims 12 and 13 are allowable, even in view of the combination of Takenaka, Inoue, and Ogure, and claims 28 and 29 are allowable as depending from allowable independent claims 12 and 13. Accordingly, this portion of the Office Action is not supported, and the rejection of claims 28-29 should be withdrawn. Reconsideration and allowance of claims 28-29 is respectfully requested in view of these arguments and amendments.

At section 6, the Office Action rejects claims 30 and 31 under 35 U.S.C. §103(a) as being unpatentable over the combination of Takenaka and Inoue as applied to claims 12 and 13, further in view of U.S. Patent No. 5,396,160 of Chen ("Chen"). According to the Office Action, Takenaka and Inoue disclose all recitations of claims 30-31 except for mobile robot having an operator's operation control unit outside of the robot" and "communication means," but that this deficiency is cured by Chen. However, as will be discussed below, each of claims 30-31 recites subject matter which is neither disclosed

nor suggested in Takenaka, Inoue, or Chen. Applicants respectfully traverse this rejection and request reconsideration in view of the current amendment and the following arguments.

Specifically, the Office Action states that Inoue provides the elements of “an operator’s operation control unit outside of the robot” and “communication means” as specified in claims 12 and 13. In particular, the Office Action cites element 40 of FIG. 5 and the associated text at column 6, lines 38-43. This cited text references an external computer 40 adapted to receive and access the external storage memory 24 when removed from the robot. The cited section of the Inoue describes the storage of audio and image files on external storage memory 24, and as described above, the external storage memory 24 is removable from the robot, thereby allowing the audio and image and audio files to be presented to a user on the external computer 40. The Office Action argues that while neither Inoue nor Takenaka contains the limitation of using a self diagnosis means to monitor the communication means, Chen provides this claim element. The Office Action cites the specification of Chen between line 56 of column 6 and line 2 of column 7, which specifies that a computer 12 periodically sends a synchronization command 62 to a controller 14 and monitors for delays in a response signal 64 from the controller 14.

Chen contains no comparable elements to the claimed abnormality information outputting means and abnormality information storing means of claims 12 and 13 and,

therefore, does not make up for the deficiencies in Takenaka and Inoue. Claims 30 and 31 should be allowed as depending from allowable claims 12 and 13.

In addition, claims 30 and 31 are separately allowable, even if the rejection of claims 12 and 13 continues to stand. The external computer 40 in Inoue is not “an operator’s operation control unit provide outside the robot” since the external computer in Inoue merely receives stored data from the external storage memory 24 and in no way controls the operation of the robot. Likewise, there is simply no “communication means” presented or suggested in Inoue because the external memory 24 is manually removed from the robot and inserted into the computer 40. In fact, the purpose of the robot design in Inoue is to allow a user to manually remove the external memory 24 from the robot to allow the user to access the stored data without communications between the robot and the computer 40.

Accordingly, this portion of the Office Action is not supported, and the rejection of claims 30-31 should be withdrawn. Reconsideration and allowance of claims 30-31 is respectfully requested in view of these arguments and amendments.

Claim Objections

In Section 7, the Office Action objects to claims 14–19 as depending from rejected claims 12 and 13 but states that these claims would otherwise be allowable if rewritten in independent format. This objection is now moot since claims 12 and 13, as presently amended, are allowable in view of the arguments presented above.

Specifically, the Office Action notes that a search of the prior art did not identify references containing the limitations of independent claims 12 or 13 combined with limitations from claims 14 and 15 of the “dynamic model behavior correcting means” and the “control means,” whereby “the self-diagnosis means self-diagnoses that the quantity of state is an abnormal value when the error in the quantities of state of the dynamic model and the robot exceeds a predetermined value.” Alternatively, the Office Action states that claims 12 and 13 would be allowable if amended to include the “inclination sensor” and related limitations from claims 16 and 17 or the “angle detector” and the related limitations from claims 18 and 19.


Conclusion

In conclusion, as discussed above, each of the pending claims now recites subject matter which is neither disclosed nor suggested in the cited prior art. Applicants submit that the recited subject matter is more than sufficient to render the recited embodiments of the present invention non-obvious to a person of ordinary skill in the technical art of telecommunications. It is respectfully requested that claims 12-31 be allowed in view of the above arguments, comments, and remarks, and this application pass to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



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